

Appl. No.: 10/691,044
Amdt. dated June 1, 2006
Reply to Office Action of March 3, 2006

REMARKS/ARGUMENTS

Reconsideration and allowance of the above identified application is respectfully requested in light of the above amendments and the following remarks.

To briefly summarize, the present invention relates to a method and apparatus for producing a high-strength and low-shrinkage synthetic flat yarn. After melt spinning, the filaments are combined to a yarn and drawn. Subsequently, the yarn is compressed to form a plug under the influence of heat. This plug is transported over a certain distance, so that the yarn relaxes in a low-tension state and under the influence of the increased temperature. Finally the plug is disentangled and withdrawn from the plug under sufficient tension to remove any significant crimp and form a high-strength, low shrinkage flat yarn, which is wound into a package.

As noted in the specification of the present application, it has been previously proposed to produce high-strength synthetic flat yarns by a process involving melt spinning and drawing an advancing yarn, allowing the yarn to relax, and then winding the yarn into a package, note for example EP 0 164 624. However, the process as described in this prior document is problematic by reason of the relatively high tension required to advance the yarn through the relaxation zone.

The present invention avoids the problem of high tension by providing a relaxation treatment which has a long dwelling time, and which is performed under low tension. In particular, the yarn, after being melt spun, cooled, and drawn, is fed into a relaxation device which is in the form of a heated stuffer box chamber. The speed of advance through

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the chamber is inherently reduced from the supply speed, because of the compression which occurs in forming the plug. Thus a significant dwelling time is achieved while the yarn is under no significant tension. Contrary to a conventional yarn crimping device, where the yarn undergoes cooling to set the crimp, in the present invention the yarn is withdrawn from the relaxation device in a heated state and is under sufficient tension to remove any significant crimp and thus produce a typical flat yarn. The fact that a yarn stuffer box or crimping chamber can be used in a process to produce a non-crimped or flat yarn, is directly contrary to accepted practices and would not have been obvious to one skilled in the art.

In the Official Action, all of the claims were rejected as being anticipated or rendered obvious by Hamlyn, U.S. Patent No. 4,251,481. The Hamlyn patent relates to a device to produce a flat yarn, and from this document the problem of shrinkage is recognized. To produce a low shrinkage yarn, the yarn is guided between two godets with low tension to provide time for relaxation. However, for high production speeds, this time is not sufficient for a complete relaxation. This document does not contain any hint that it could be possible to compress the yarn to a plug for providing more time for relaxation, or that the compressed yarn could be removed from the plug under conditions to produce a non-crimped or flat yarn. In fact, this document confirms that the skilled person would try to avoid any crimping of the yarn, when producing a flat yarn.

All of the claims were also rejected as being anticipated or rendered obvious by Corsini, GB 135 2624, which describes a method which is specially intended to produce a crimped yarn (note the title of the document). In accordance with the

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teaching of this document, three yarns are withdrawn from bobbins and combined, the resulting strand is drawn, and the strand is compressed in a stuffer box chamber. Afterwards, the crimped yarn is drawn downstream of the stuffer box chamber and heated between two godets "for eliminating, visible crimps" (see page 2, line 53). This however does not mean that the yarn afterwards is flat in the sense of the present invention, and the document specifically teaches that the resulting yarn contains a defined number of crimps per centimeter, namely in the range of from 2 to 8 (see page 2, lines 71-75). This means that this document also does not contain any teaching that a stuffer box chamber can be employed for producing a flat, non-crimped yarn. Further, Corsini does not relate to a melt spinning process, so that the step of compressing a melt spun yarn, to achieve a tension free relaxation for a relatively long dwelling time at a high temperature and so as to influence the shrinkage of the yarn, is not taught or suggested.

All of the claims were also rejected as being anticipated or rendered obvious by Baader, DE 101 00 762. This patent discloses a method for melt spinning a multi filament yarn, in which the yarn after drawing is compressed to a plug, whereby the plug is stored or even wound into a package. This method does not involve the production of a smooth flat yarn and the document does not provide any help concerning shrinkage or disentangling the plug to produce a flat yarn.

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In summary, it is submitted that all of the pending claims are allowable over the art of record, and an early and favorable action is solicited.

Respectfully submitted,



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